with the ectoderm." 2. "The direction of transmission of an impulse is already determined by the position of the cell in the ectoderm." That is, the receiving side of a cell is the one originally toward the surface, while the giving pole is turned toward the interior of the body. Under these principles, and keeping in mind the formation of cerebral and optic vesicles, primary and secondary, it is made perfectly clear why the optic nerve fibers should grow first toward the vitrious chamber and afterwards pierce the retina in order to reach the brain. This also explains the inversion of the rod and cone layer, these elements being the receiving poles and the line between them, and the pigment layer of the retina being the original external surface of the body. The well chosen cuts render this intricate problem doubly lucid.

On the Method of Transmission of the Impulse in Medullated Fibers. E. R. EDES. *Journal of Physiology*, Vol. XIII. p. 431.

Experiments described in this paper were made in the physiological laboratory of the Harvard Medical School under the direction of Dr. Bowditch, and results confirm in the main that author's previous work upon the non-fatigability of nerve fibers.

The method employed consists in using the action current as a measure of the nerve impulse. This is read by means of a delicate capillary electrometer. The muscle was retained, and although not used to measure the impulse, gave a fine comparison of muscle and nerve fatigue. This is expressed in two charts (p. 437), both of which show that the muscle tires rapidly for the first few minutes, then more slowly and finally very slowly; the nerve on the other hand practically holds its own. Up to five hours' continuous stimulation, the action current suffered no diminution. That this is not true for longer periods was due to trouble with the electrometer. Experiments let run over night (11-14 hours) showed an action current of about one-fourth the original strength. According to Maschek, when such diminution occurs on cutting the nerve off so as to place a fresh cut section on the electrodes, the action current returned to normal. This was not the case with Edes' experiments. Herzen's strychnine experiments were also repeated on rabbits and frogs, the conclusion therefrom being, contrary to Herzen's, that the "exhaustion obtained could be located wholly in the muscle."

In a short addendum are summed up the results of a number of experiments made for the purpose of repeating Demoor's recent work upon the action of silver nitrate upon normal and exhausted nerve fibers. Demoor's statement is that "Frohmann's striations" are not found in exhausted nerves. The experiments of Edes gave the impression that stimulation "does make some *slight* difference in the behavior of the nerve fiber towards nitrate of silver."

Der Hund ohne Grosshirn. Siebente Abhandlung über die Verrichtung des Grosshirns. F. GOLTZ. Archiv. für die gesammte Physiol. Bonn, 1891, 2 Bd. LI. S. 570-614. 1 Taf.

This paper forms the strongest protest yet uttered against the doctrine of cerebral localization, so far at least as the dog is concerned.

Goltz gives us the results of removing the entire cerebral cortex (except a mere shaving of the inferior temporal lobes, left to protect the optic tracts) in three dogs. The first lived fifty-one days; the second, ninety-two days; the third lived eighteen and one-half months. In order to more fully meet the arguments of his opponents, the operations were performed with the knife.

Since results were uniform, mention of the third case will suffice. Upon June 27, 1889, the left hemisphere was removed. The right hemisphere was similarly excised a year later, June 17, 1890. The dog, in general, continued in good health, and was killed December 31, 1891.

Three days after the second operation, the dog could walk without help. Subsequent tests demonstrated that hearing was present in some degree, the animal being awakened by the blast of a horn. He also reacted to light, and was found to be sensitive to touch and pain in all parts of the body. Even the presence of smell, Goltz seems to consider, admits of question, since this could not be satisfactorily tested. The animal sneezed when tobacco smoke was blown in his face. He could taste, as was evinced by his refusing, with every expression of disgust, meat which had been rolled in quinine. The same meat was similarly rejected by his own dog on first tasting, but was subsequently gulped down "out of politeness." A brainless dog does lack politeness, as the author humorously adds.

Two points are of special interest to brain physiology in general. The first of these is that this dog required much shorter periods of rest or sleep than normal animals; and also became more quickly fatigued. This leads to the second point, which is that if over-excited or over-tired, the dog is likely to be thrown into a fit of epilepsy (p. 591). That an animal deprived of all motor cortex can exhibit typical epilepsy, is certainly revolutionary to post-Jacksonian ideas of the cause and origin of epileptic fits.

The brain was turned over to Schrader for examination and description. Dorsal and ventral views are given in the plate.

The Arrangement of the Sympathetic Nervous System, Based Chiefly on Observations upon Pilo-Motor Nerves. J. N. LANGLEY. *Journal of Physiology*, Vol. XV. pp. 176-244. Plates VII.-IX. Sept., 1893.

Reactions of the hair muscles are found to be of great service in determining the course of sympathetic fibers from the cord, through the sympathetic ganglia to their distribution in the skin. In brief this course is found to be the same as that of vasomotor and secretory fibers; viz., out of the cord by the spinal roots, through the white rami to the sympathetic ganglia, from this back to the spinal nerves, by the grey rami, and finally along with the cutaneous nerves to the skin. In the cord pilo-motor nerves are shown by properly graded stimulus to lie in the lateral columns; and their course out of the cord is entirely by the anterior roots. By the nicotin method, injection of ten milligrams into a vein, for the cat, it was demonstrated that all pilo-motor fibers are interrupted by cells in the sympathetic ganglia in passing through them to the skin. Distribution in the skin is found to coincide with that of the sensory nerves. It is unilateral, overlapping the mid-line very little, if at all; and successive grey rami supply successive sensory areas, generally quite sharply defined. A minute's description of relations of skin-areas to the different nerves is given for the cat, and the paper closes with deductions therefrom as to the arrangement of the sympathetic system in man.

On Disturbances of Sensation with Especial Reference to the Pain of Visceral Disease. HENRY HEAD. *Brain*, Vol. XVI. pp. 1-133. Plates I. and II. 42 illustrations in text. 1893.

A convenient paper for reference upon distribution of sensory nerves in the skin, aside from its main purpose. Areas for touch supplied by the spinal nerves have been shown by Sherrington to